



## **Q&A about the New StudioHub+ Wiring Solution**

### **from Angry Audio**

*Angry Audio's new StudioHub+ interconnect product is a radical approach to studio wiring because it uses CAT-5 cable and connectors. While standard in the data industry, CAT-5 cabling technology is not usually employed to conduct audio signals. Here are some frequently asked questions and answers on how and why we took this approach.*

#### **What is StudioHub+?**

It's a wiring system made up of pre-made patch cables, RJ-45 connectors special connecting blocks, and companion amplifiers that are all designed to plug together easily and work together in any studio. Because StudioHub+ uses CAT-5 data cable it works equally well for analog and digital studio wiring.

#### **What is Category-5 wiring?**

This cable meets an industry standard for shielded twisted pairs (STP) called TIA/EIA 568B, which specifies attenuation, crosstalk and bandwidth performance (among others) all the way up to 100 MHz. It's used for almost every computer network system installed today. The CAT-5 cable used in StudioHub+ consists of 4 tightly twisted pairs, surrounded by one common foil shield, drain wire and plastic insulation.

#### **But you can't use computer cable for audio wiring - can you?**

Actually, the tightly twisted pairs in CAT-5 cable work great at audio frequencies. That's because the low capacitance performance specifications required of data cables result in razor flat frequency response at audio bandwidth. It's now becoming generally accepted that "digital audio" wire makes the best analog cable.

#### **Are those little RJ-45 phone connectors any good for audio?**

It's true that we're not used to seeing these connectors used for audio – but they do a great job handling most of our high-speed critical data communications in broadcast and throughout the data world. The RJ-45 connectors used in StudioHub+ are the very best available with 50 um gold plated and long-life rated spring contacts. And, StudioHub gets a lot of mileage out of the very dense (8 conductors plus shield) population of pins in this small connector.

#### **What use do you make of the 8 wires in the StudioHub+ cable?**

Two pairs are used for left and right audio, one pair for DC, and the fourth pair for data.

#### **What's the DC pair for?**

This is one of the most innovative features of StudioHub+. When any system active component (headphone amp, mic pre-amp, matching amplifier, etc.) is plugged into StudioHub+, it powers-up automatically like a phantom powered mic. +/- 15 volts DC is centrally provided by the "Hub" connecting block.

#### **Is CAT-5 cable OK to use for AES/EBU digital signals?**

Actually, CAT-5 turns out to be one of the best cables to use for digital audio signals. In tests conducted by the BBC Research and Development Department on cable for AES/EBU signals, CAT-5 shielded twisted audio pair cable "offered the highest performance of all the cables tested here."<sup>1</sup> And, these BBC tests found that performance was excellent all the way out to 970 meters of cable (over ½ mile).

<sup>1</sup> – Tests conducted by D.G. Kirby, BBC Research and Development Department, and published in a paper titled "Twisted-pair cables for AES/EBU Digital Audio Signals" presented at the 1994 AES International convention, Amsterdam

### **Is CAT-5 cabling OK for digital audio signals?**

Category-5 wiring was developed for high-speed data delivery. Actually, the 3 Mb/sec bandwidth of most of today's digital audio equipment is a cakewalk for category 5 cable, which is rated for 100 Mb/sec networks. But as the bandwidth requirements for digital audio signals increase (some systems now contemplate 96 kHz sampling rates,) a high velocity cabling system will be critical.

### **Why does the StudioHub+ system use CAT-5 cable with an overall shield?**

The entire StudioHub+ system is shielded for the best performance in high RF environments and for the elimination of any possible crosstalk between cables in multi-cable bundles. Shielded cables also provide the very best data performance.

### **Is CAT-5 wiring 110 ohm?**

Yes. Well, technically, most CAT-5 cables are rated at 100 ohms. This is fine because the AES specification for AES/EBU impedance is +/- 20%, (or 88 to 120 ohms.) Actually, it is the capacitance of the cable, not the impedance, that has a much greater effect on digital and audio performance. And CAT-5 cables are all very low capacitance - 30 pf or lower.

### **But I thought that audio circuits were supposed to be 600 ohms.**

Audio circuits using CAT-5 cable are 600 ohms (or whatever the impedance is of the source equipment). That's because with any audio circuit the impedance is fully determined by the source and terminating gear - not the wire. At audio frequencies, any cable would have to be over 2 miles long (a quarter wavelength at 20 kHz) to have any effect on the impedance.

### **Shouldn't I use one of the new 110-ohm digital audio cables for my digital sources?**

Those cables are fine if you want to follow a more traditional wiring model for your digital equipment (XLR connectors, one cable per source, etc.) or if you want to replace one circuit at a time. StudioHub+ is designed more as a complete wiring system solution for efficiently re-wiring a whole studio or complete new facility.

### **Is there any crosstalk between the pairs in the CAT-5 cable?**

As long as your circuits are balanced, there is almost no left/right crosstalk inside the cable. Tests conducted by Angry Audio measured greater than 102 dB of separation between pairs at 20 to 20kHz in a 200' run of cable using a quality balanced input circuit (85dB of common mode rejection). Even with an only fair quality balanced input circuit (50 dB of CMRR), separation was still greater than 90 dB.

### **So, must all the audio and digital signals used with StudioHub+ be balanced?**

Yes, or crosstalk will degrade. That's why we provide the "MatchJack" balancing amplifiers and other integrated system pre-amplifiers. AES/EBU digital audio signals are balanced right out of the box, and require no conditioning.

### **I'm not building a digital studio now - why use a "digital ready" system?**

Because you never know when you'll have to convert some or all of your source gear to digital. StudioHub+ avoids the cost, hassles, and down time of pulling new cable. And even if you never utilize any digital audio equipment, StudioHub+ cables between studios can be used for LAN and for any other data applications.



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